

Thermal Paste Spread and Ready for Use

New technical and logistics service

Semikron specialist in power module manufacturing and processing, has increased its portfolio of technical and logistics services to include the application of thermal paste to power modules. The introduction of this new service sets Semikron apart from other power semiconductor manufacturers.

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The optimum application of thermal paste onto the semiconductor module ensures good thermal performance once the module is assembled on the heat sink. Too much thermal paste reduces the thermal impedance and can in extreme cases lead to cracking in the insulating ceramic substrate during assembly. Too little thermal paste results in thermal overload of the power semiconductor which shortens module service life.

Thermal paste is normally applied in printing processes or using a sponge rubber roller. The manual rolling process, however, is not reproducible, which means that quality control is very difficult. Thermal paste application is therefore a step in the production chain that cannot be reproduced or quality checked and is a real headache for quality control and production managers. Printing processes, by way of contrast, produce reproducible results, but require costly purpose-built tools. To solve this problem, it makes good sense for the manufacturer, rather than the user of the power module to apply the indispensable thermal paste layer. For the module manufacturer can provide a controlled quality and offer thermal paste application at attractive prices thanks to the large production volumes.

For more than 10 years Semikron has continually expanded its know-how in the field of screen and stencil printing. This ever growing expertise is what has enabled Semikron to develop a volume-production-viable thermal paste application process for semiconductor modules. This new automatic screen printing process has now been added to the service portfolio. The thermal paste layer thickness is module-specific and is moni-

tored using Six Sigma tools. The application process boasts an accuracy of $\pm 10\mu\text{m}$. With a process capability of 1.33, as few as 60 prints in 1 million lie out with the specified tolerances. With such properties, this process fully meets the requirements for power semiconductor modules.



Figure 1: Thermal paste spread and ready for use

Modules with thermal paste layer are transported in purpose-built patented packaging known as blister packaging. Blister packaging guarantees contact-free transportation. Plus, modules with thermal paste layer can be stored in blisters for up to 18 months. The storage properties of Semikron blisters were tested in high-temperature, low-temperature, warm, moist and humid conditions with subsequent thermal resistance and power cycling tests.

The next stage is just as uncomplicated: once the modules reach the customer, they can be simply removed from their packaging and placed onto the heat sink. Heat sink assembly to the module is therefore a quick and straightforward procedure. With no additional assembly stage, production logistics is also simpler. Production workers do not come into contact with the thermal paste,

which means there is no risk of thermal paste being carried over into production. Thermal paste application at Semikron ensures that the paste is applied homogeneously with the optimum layer thickness. This reduces DCB cracking and ensures optimum heat dissipation and optimum module function. The automatic screen-printing process and statistics-based process control assure high process capability. The use of tested thermal paste systems and statistic process control provides an excellent long-term reliability.

Semikron first introduced thermal paste application as an optional additional service for its MiniSKiiP® product family. Every product in this family is available with a thermal paste layer, if required. MiniSKiiP®s are available as CIB (up to 100 A) and sixpack modules (up to 150 A) with the corresponding input bridge modules. MiniSKiiP® modules are used as power switches in converters, UPS systems and power supply systems. The customer can choose between a silicon-based and a non-silicon-based thermal paste. The high order numbers are testimony to the success of the new service. The focus is therefore on expanding the service to other module families. Greater capacity is currently being created to enable the company to increase the print volume over the coming years to as many as 2 million modules per year. Thermal paste application is soon to be available as an optional service for the standard bipolar SEMIPACK® range, which are used in drives, temperature control systems or in general control systems.

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